

REMARKS

[0001] Applicant respectfully requests reconsideration and allowance of all of the claims of the application. The status of the claims is as follows:

- Claims 1, 26-31, 41, 43-45, 51, 55, 57-59 and 67 are currently pending
- Claims 1, 26, 27, 28, 29, 31, 41, and 55 are amended herein
- Claims 2-25, 32-40, 42, 46-50, 52-54, 56, 60-66 and 68-70 are withdrawn herein

Cited Documents

[0002] The following documents have been applied to reject one or more claims of the Application:

- Viola: Viola, "Robust Real-Time Object Detection", 2nd Intl Workshop on Statistical and Computational Theories of Vision – Modeling, Learning, Computing and Sampling, July 2001.
- Wright: Wright et al, U.S. Patent Application Publication No. 2006/0088894.
- Rowley: Rowley, "Neural Network-Based Face Detection", PAME IEEE, January 1998.
- Ai: Ai, "A Subspace Approach to Face Detection with Support Vector Machines", IEEE, 2002.

§ 103 Rejections: Viola, Wright, and Rowley

[0003] Claims 55, 57-59 and 67 stand rejected under 35 U.S.C. § 103 as allegedly being obvious over Viola, in view of Wright and noted with Rowley. Applicant respectfully traverses the rejection.

Independent Claim 55

[0004] Applicant submits that the Office has not made a *prima facie* showing that independent claim 55 is obvious in view of the combination of Viola, Wright, and Rowley. Applicant submits that the combination of Viola, Wright, and Rowley does not teach or suggest the following features of this claim, as amended (with emphasis added):

An apparatus comprising:
one or more processors; and
memory having instructions executable by the one or more processors to detect at least one human face within a digital image, the memory including:

a boosting filter stage configured to process a set of initial candidate portions of digital image data using a boosting chain to produce a set of intermediate candidate portions, wherein the boosting chain includes a plurality of boosting chain nodes to identify candidate portions and a boot strap function following each of the plurality of boosting chain nodes, the boot strap function to use a weak learner of a previous boosting chain node in training another boosting chain node of the boosting chain, wherein *the weak learner includes building a simple decision stump on a histogram of a Haar-like feature on a training set*; and

a post-filter stage configured to process said set of intermediate candidate portions to produce a set of final candidate portions, wherein at least one of said final candidate portions includes detected face image data.

[0005] Claim 55 recites in part, "the weak learner includes building a simple decision stump on a histogram of a Haar-like feature on a training set." The Office cites Wright

as allegedly teaching a weak learner of a boosting chain node. (Office Action, page 4, lines 7-12). Wright generally pertains to "methods for aiding in, or otherwise making, a diagnosis of prostate cancer or benign prostate hyperplasia" by "detecting various protein biomarkers of defined molecular weight and correlating the detection to a diagnosis of prostate cancer, benign prostate hyperplasia or to a negative diagnosis." (Wright, abstract). Specifically, Wright discloses the following:

a method includes a) obtaining mass spectra from a plurality of samples from normal subjects, subjects diagnosed with prostate cancer and subjects diagnosed with benign prostate hyperplasia; b) applying a boosted decision tree analysis to at least a portion of the mass spectra to obtain a plurality of weighted base classifiers comprising a peak intensity value and an associated threshold value; and c) *making a probable diagnosis of at least one of prostate cancer, benign prostate hyperplasia and a negative diagnosis based on a linear combination of the plurality of weighted base classifiers.*

(Wright, paragraph [0014], emphasis added).

[0006] Applicant submits that the weighted base classifiers of Wright fail to disclose the cited elements of claim 55 because the weighted base classifiers of Wright fail to build "a simple decision stump on a histogram of a Haar-like feature on a training set," as recited in claim 55. Rather, Haar-like features are digital image features used in object recognition and thus are inherently absent from the method of Wright, which focuses on diagnosing prostate cancer from a variety of mass spectra samples.

[0007] Viola and Rowley fail to remedy the deficiencies in Wright noted above with respect to claim 55. Consequently, the combination of Viola, Wright, and Rowley does not teach or suggest all the elements and features of this claim. Accordingly, Applicant respectfully requests that the rejection of this claim be withdrawn. Due to the Applicant's earnest belief that the claim 55, as rejected under Section 103, is believed

allowable for reciting elements which are not taught or suggested in the combination of Viola, Wright, and Rowley, Applicant will not address motivation to combine the Viola, Wright, and Rowley reference with respect to claim 55 during this response. However, Applicant hereby reserves the right to further challenge the motivation to combine the Viola, Wright, and Rowley references.

[0008] The amendments to claim 55 are supported by the specification on at least page 20, lines 3-6. No new matter is added.

Dependent Claims 57-59 and 67

[0009] Claims 57-59 and 67 ultimately depend from independent claim 55. As discussed above, claim 55 is believed to be allowable over the cited art. Therefore, claims 57-59 and 67 are also allowable over Viola, in view of Wright and noted with Rowley at least for their dependency from independent claim 55. These claims may also be allowable for the additional features that they recite.

§ 103 Rejections: Viola, Wright, Ai, and Rowley

[0010] Claims 1, 26-31, 41, 43-45 and 51 stand rejected under 35 U.S.C. § 103 as allegedly being obvious over Viola, in view of Wright and Ai and noted with Rowley. Applicant respectfully traverses the rejection.

Independent Claim 1

[0011] Applicant submits that the Office has not made a *prima facie* showing that independent claim 1 is obvious in view of the combination of Viola, Wright, Ai, and Rowley. Applicant submits that the combination of Viola, Wright, Ai, and Rowley does

not teach or suggest the following features of this claim, as amended (with emphasis added):

A method for use in detecting faces within a digital image, the method comprising:

processing via a processor, in a pre-filter stage, a set of digital image data to produce a set of initial candidate portions using at least one feature algorithm, *the pre-filter stage including a linear filter based on a decision function having coefficients that are determined during a learning procedure;*

processing via a processor, in a boosting filter stage, the set of initial candidate portions to produce a set of intermediate candidate portions, the boosting filter stage including:

a boosting chain having a plurality of boosting chain nodes to identify candidate portions and a boot strap function following each of the plurality of boosting chain nodes, the boot strap function to use a weak learner of a previous boosting chain node in training another boosting chain node of the boosting chain; and

processing via the processor, the set of intermediate candidate portions in a post-filter stage to produce a set of final candidate portions, wherein the post-filter stage includes an image pre-processing process, a color-filter process, and a support vector machine (SVM) filter process.

[0012] Claim 1 recites in part, “the pre-filter stage including a linear filter based on a decision function having coefficients that are determined during a learning procedure.”

The Office cites Viola as allegedly teaching the pre-filter stage. (Office Action, page 10, lines 21-22). In general, Viola is directed to a frontal face detection system. (Introduction). Specifically, a cascade of classifiers is constructed “by training classifiers using AdaBoost. Starting with a two-feature strong classifier, an effective face filter can be obtained by adjusting the strong classifier threshold to minimize false negatives.” (The Attentional Cascade, Page 11).

[0013] Applicant submits that the pre-filter stage of Viola fails to disclose the cited elements of claim 1 because the pre-filter of Viola fails to include “coefficients that are

determined during a learning procedure" as recited in claim 1. Since Viola's pre-filter stage is limited to using the sign information of a one-dimension weak learner, the discrimination capability of Viola's decision function fails to include "a linear filter based on a decision function having coefficients that are determined during a learning procedure" as recited in claim 1.

[0014] Wright, Ai, and Rowley fail to remedy the deficiencies in Viola noted above with respect to claim 1. Consequently, the combination of Viola, Wright, Ai, and Rowley does not teach or suggest all the elements and features of this claim. Accordingly, Applicant respectfully requests that the rejection of this claim be withdrawn. Due to the Applicant's earnest belief that the claim 1, as rejected under Section 103, is believed allowable for reciting elements which are not taught or suggested in the combination of Viola, Wright, Ai, and Rowley, Applicant will not address motivation to combine the Viola, Wright, Ai, and Rowley reference with respect to claim 1 during this response. However, Applicant hereby reserves the right to further challenge the motivation to combine the Viola, Wright, Ai, and Rowley references.

[0015] The amendments to claim 1 are supported by the specification on at least page 4, lines 17-33. No new matter is added.

Dependent Claims 26-31

[0016] Claims 26-31 ultimately depend from independent claim 1. As discussed above, claim 1 is believed to be allowable over the cited art. Therefore, claims 26-31 are also allowable over Viola, in view of Wright and Ai and noted with Rowley at least for their dependency from independent claim 1. These claims may also be allowable for the additional features that they recite.

[0017] For example, dependent claim 27 recites: "The method as recited in Claim 1, wherein the decision function is $(a_1 f_1(x) > b_1) \wedge (a_2(f_1(x) + r f_2(x)) > b_2)$, where $(a_1 f_1(x) > b_1)$ is a simple decision stump function learned by adjusting a threshold according to face/non-face histograms of the at least one feature and $(a_2(f_1(x) + r f_2(x)) > b_2)$ is acquired by a Linear Support Vector Machine (LSVM) optimization processes." The Office cites Viola as allegedly teaching the decision function of dependent claim 27.

[0018] Applicant submits that the decision function, $H(x)$, of Viola is presented as: $H(x) = \text{sign}(\sum_{i=1}^T \alpha_i h_i(x) + b)$ where α_i is a coefficient, b is a threshold, and $h_i(x)$ is a one-dimension weak learner. Since the decision function of Viola is limited to using the sign information of a one-dimension weak learner, Viola's decision function fails to include elements "acquired by a Linear Support Vector Machine (LSVM) optimization processes" as recited in claim 27. Thus, Applicant submits that claim 27 is allowable over the cited art.

[0019] The amendments to claim 27 are supported by the specification on at least page 21, lines 9-12. No new matter is added. Accordingly, claims 26-31 are allowable for at least the foregoing reasons.

Independent Claim 41

[0020] Applicant submits that the Office has not made a *prima facie* showing that independent claim 41 is obvious in view of the combination of Viola, Wright, Ai, and Rowley. Applicant submits that the combination of Viola, Wright, Ai, and Rowley does not teach or suggest the following features of this claim, as amended (with emphasis added):

A computer-readable medium having computer-implementable instructions for causing at least one processing unit to perform acts comprising:

detecting possible human face image data within a digital image using a multiple stage face detection scheme that includes:

a boosting filter stage to process a set of initial candidate portions of digital image data to produce a set of intermediate candidate portions using a plurality of boosting chain nodes and a boot strap function following each of the plurality of boosting chain nodes, the boot strap function to adjust a sample weight initialized for a current boosting classifier of a current boosting chain node based on a classification error rate of a previous boosting node; and
a post-filtering stage configured to process the set of intermediate candidate portions to produce a set of final candidate portions, wherein the post-filter stage includes an image pre-processing process, a color-filtering process, and a support vector machine (SVM) filtering process, *the SMV filtering process to perform wavelet transformation on the set of intermediate candidate portions.*

[0021] Claim 41 recites in part, “the SMV filtering process to perform wavelet transformation on the set of intermediate candidate portions.” The Office cites Ai as allegedly teaching an SVM process. (Office Action, page 9, lines 15-18). Ai generally pertains to training a linear SVM classifier “as a filter to produce a subspace in which a non-linear SVM classifier with Gaussian kernel is trained for face detection.” (Ai, abstract).

[0022] Applicant submits that the two stage SVM procedure of Ai fails to disclose the cited elements of claim 41 because Ai fails to teach or suggest performing a “wavelet transformation” as recited in claim 41. Rather, a thorough search of Ai fails to uncover any mention of wavelet transformation or any related variation of wavelet transformation as applied to the recitations of Applicant’s claim 41.

[0023] Viola, Wright, and Rowley fail to remedy the deficiencies in Ai noted above with respect to claim 41. Consequently, the combination of Viola, Wright, Ai, and

Rowley does not teach or suggest all the elements and features of this claim. Accordingly, Applicant respectfully requests that the rejection of this claim be withdrawn.

[0024] The amendments to claim 41 are supported by the specification on at least page 31, lines 4-12. No new matter is added.

Dependent Claims 43-45 and 51

[0025] Claims 43-45 and 51 ultimately depend from independent claim 41. As discussed above, claim 41 is believed to be allowable over the cited art. Therefore, claims 43-45 and 51 are also allowable over Viola, in view of Wright and Ai and noted with Rowley at least for their dependency from independent claim 41. These claims may also be allowable for the additional features that they recite.

Conclusion

[0026] Applicant respectfully requests reconsideration and prompt issuance of the application. If any issues remain that prevent issuance of this application, the Examiner is urged to contact the undersigned representative for the Applicant before issuing a subsequent Action.

Respectfully Submitted,

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Representative for Applicant



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